IN THE UNITED STATE DISTRICT COURT
FOR THE WESTERN DISTRICT OF MISSOURI
KANSAS CITY DIVISION

IAN POLLARD, ON BEHALF OF HIMSELF AND ALL OTHERS SIMILARLY SITUATED, Plaintiff, v. REMINGTON ARMS COMPANY, LLC, SPORTING GOODS PROPERTIES, INC., and E.I. DU PONT DE NEMOURS AND COMPANY, Defendants.	)	No. 4:13-cv-86-ODS

AMENDED DECLARATION OF CHARLES W. POWELL

CHARLES W. POWELL, being first duly sworn on oath, states and declares as follows:

1.0 I am over 21 years of age and am competent to testify concerning and have personal knowledge of each of the matters set forth herein.

2.0 I am a Registered Professional Engineer. I am the President and founder of Support Services Engineering Corporation (SSEC) and have been since 1992. For the last 28 years I have been engaged in the business of engineering failure analysis of products and structures and accident investigation. My qualifications and education are set forth in my Curriculum Vita, a true and correct copy of which is attached as Exhibit A to this Declaration. I have qualified to testify as a materials engineering expert in state and federal court jurisdictions in Oklahoma, Texas, Arkansas, Kansas, Louisiana, New Mexico, California, Florida, Michigan, and Montana. A listing of the last four years of my trial and deposition testimony is attached as Exhibit B to this Declaration.

3.0 In my engineering profession I evaluate the physical aspects of material failures, fractures, and the accident forces and conditions which cause them. I am trained in the application of advanced nondestructive evaluation techniques for product in-service reliability, structural integrity, and component design. I taught nondestructive testing principles and material defect identification to airworthiness inspectors at the Federal Aviation Administration Academy, Oklahoma City, Oklahoma, for eight years. I have taught materials analysis techniques and microscopic analysis techniques to university students, professional organizations, and state agencies, like the Oklahoma Highway Patrol. I have successfully completed the American Society for Nondestructive Testing national examination for Level III Certification in Penetrant Testing, Magnetic Testing, and Ultrasonic Testing (Certification Number GV-764). My engineering projects are performed for government agencies, such as the US Department of Defense, the US Department of Transportation, the US Coast Guard, the Federal Aviation Administration, the US Department of Justice and the Royal Australian Air Force, as well as private industry, insurance companies, and plaintiff or defense attorneys.

4.0 History of the Remington Walker Fire Control:

Historically, the Remington Arms company has manufactured rifles, particularly bolt action rifles, for many decades. This includes bolt action rifles used by the United States military services in World War I and World War II. Remington Arms is an experienced manufacturer of these rifles and of their fire control systems. A rifle's "fire control system" is that assembly of rifle components that contains the trigger and sear. When the rifle user cocks a bolt action rifle by opening and closing the bolt, the rifle's firing pin is held back under spring pressure by the sear. When the rifle user pulls on the trigger, it disengages the sear from the firing pin head, releasing the firing pin to fly forward and impact the cartridge primer, firing the chambered cartridge in the rifle.

4.1 Prior to 1948, the bolt action fire control assemblies for center fired rifles made by Remington Arms required a significant amount of trigger pull force and trigger travel to release the sear and fire the rifle. Alteration of the trigger pull force or other fire control properties in the older fire control designs could only be accomplished by the re-manufacture of the fire control components by the manufacturer or by the alteration of the fire control components by rifle owners or gunsmiths.

4.2 In 1948, US Patent No. 2,514,981, "Firing Mechanism For Firearms", was applied for by Remington employees Merle H. "Mike" Walker and Philip R. Haskell. This new fire control system, called the "Walker" fire control system for its inventor, was initially manufactured into the Remington Model 721 bolt action rifle in 1948 and subsequently used for many Remington manufactured bolt action rifles, including the Model 700 rifles that began manufacture in 1962. This new "Walker" fire control system, based on a target model fire control used on the Remington Model 37 rimfire competition bolt action rifle, was composed of a trigger, trigger connector, and sear with a number of small pins, springs, and adjustment screws installed within a housing. The diagram below identifies some of the internal components of the

Walker fire control

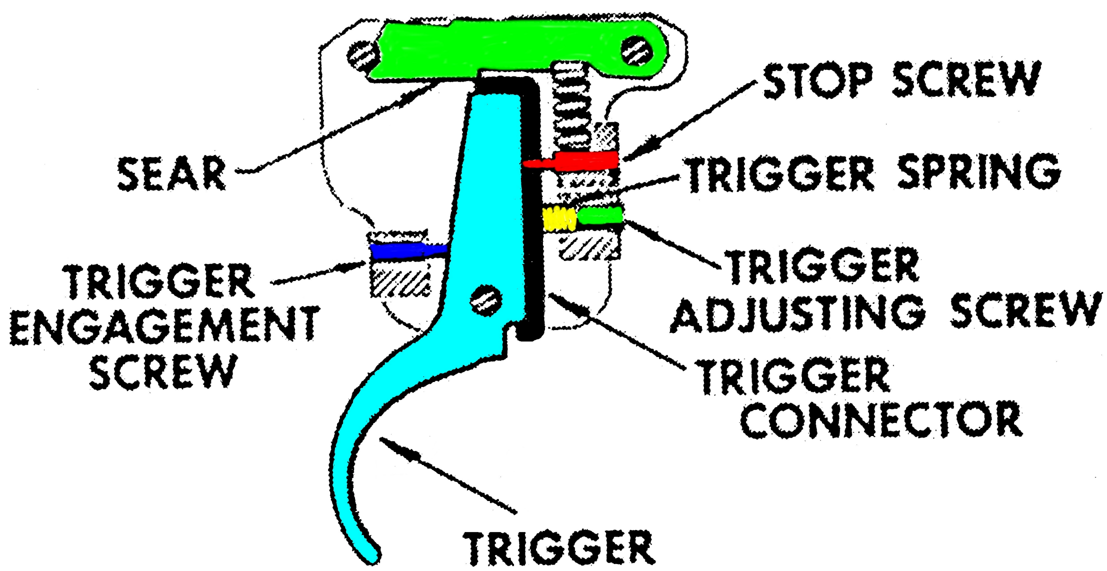

Figure 1
Cross section diagram of the Walker fire control. The U-shaped Connector is shown in black in this diagram.

4.3 In the Walker fire control, a flat U-shaped steel bar called a "Trigger Connector" is placed around the front of the Trigger. The Connector is not attached to the trigger, but is a slip fit and pushed into contact with the front of the Trigger by the Trigger Spring. It is the top rear corner of the Connector that engages and supports the Sear and keeps the rifle firing pin rearward, under spring pressure, until the Connector moves forward, as the trigger is pulled, and allows the sear to drop and release the firing pin head. This creates a trigger that is, in fact, two pieces not a single piece. The specified Trigger Connector engagement underneath the sear is designed to be very small in order to create a quick release of the firing pin with minimal movement of the trigger. The general design of this type of fire control is termed a "sear override" fire control design.

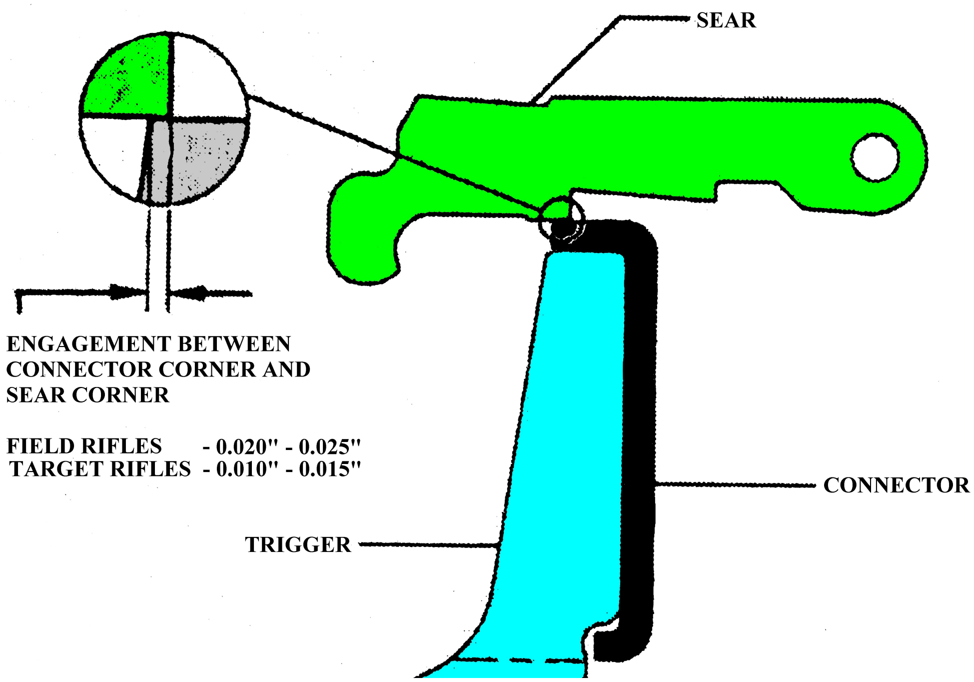

Figure 2
Closer view of the Connector engagement of the Sear. The Connector is shown in black in this diagram.

4.4 For field rifles this engagement is currently specified at 0.020" to 0.025" as shown in Figure 2, although for some of the Model 700 manufacturing period the field rifle engagement was specified at 0.015" to 0.020". For target rifles the engagement is specified at 0.010" to 0.015". Only very slight movement of the Connector will release the firing pin and fire the rifle. Every time the rifle is fired, the Connector snaps forward, leaving a small gap between the trigger body and the Connector rear surface. Slow motion video has shown that, as a rifle is fired, the Connector also whips back and forth from the trigger surface due to rifle movement generated forces, separating from the trigger body during this whipping.

4.5 The Trigger Connector in the Walker fire control is susceptible to either reducing its already minute engagement with the sear step corner or to fail to engage the sear step at all by its interaction with dirt, debris, corrosion deposits, condensation, frozen moisture, lubricant

deposits, firing deposits or manufacturing particles. Figure 3 below shows that the presence of a small amount of debris trapped between the Trigger Connector and Trigger body will keep the Connector edge from engaging correctly with the overhead sear and allow the fire control to malfunction. The Trigger Connector is an internal fire control component, uncontrolled by the rifle user. Its engagement position within the fire control housing cannot be seen or ascertained by the rifle user while using the rifle in its normally assembled state.

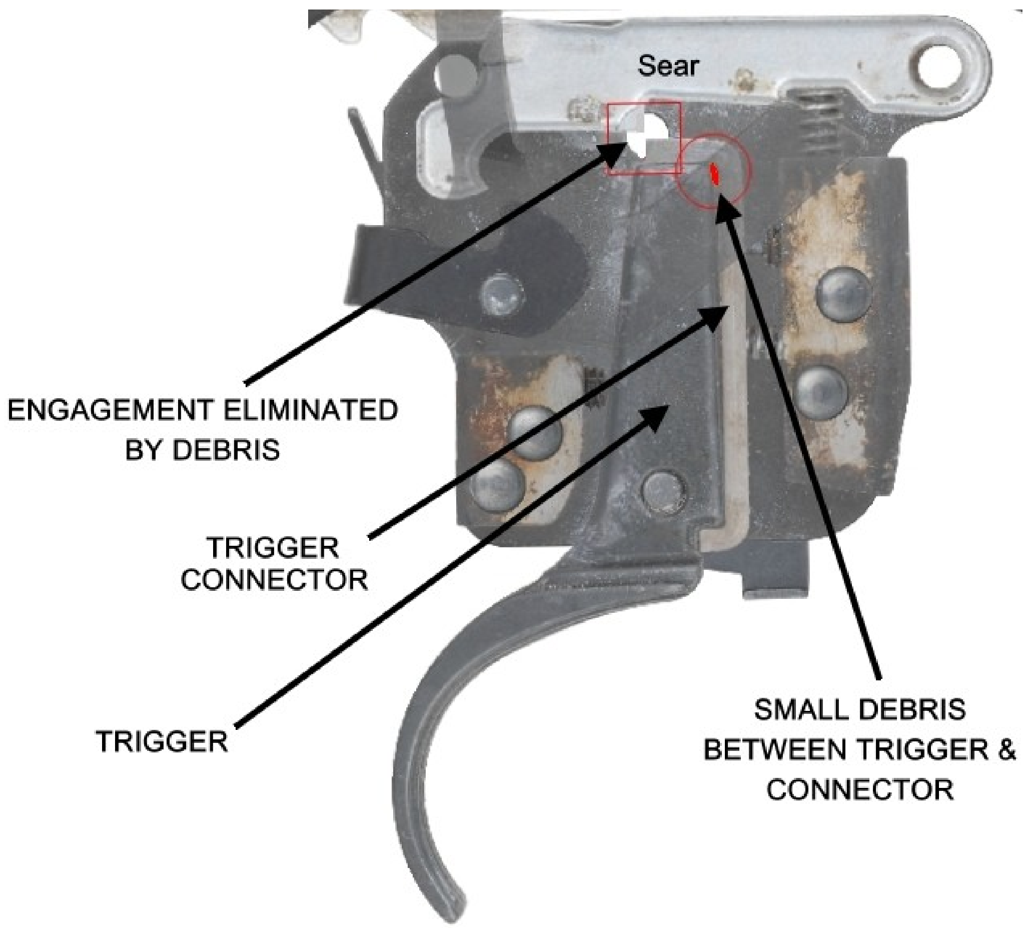

Figure 3

A small amount of debris (red) between the Trigger Connector and Trigger pushes the Connector rear edge forward to reduce or eliminate the engagement between the Connector and the Sear.

4.6 The mechanical safety on Remington 700 rifles is built into the Walker fire control assembly. The safety has a pivoting lever that, when moved to the "Safe" position, cams the Sear upward and supports its rear surface instead of using the Connector corner edge to

support the Sear. When the safety lever is moved from the "Safe" position to the "Fire" position, the safety lowers the Sear back down on top of the Trigger Connector, hopefully back into full engagement contact with the Connector corner. As a result of interferences as depicted above, the Connector does not always provide full engagement.

4.7 The interaction of the Trigger Connector with different types of interferences and the operational movement of the safety lever, first supporting and then lowering the sear, creates unintended firings of the Remington 700 rifles that use the Walker fire control. These unintended firing modes have occurred frequently enough that Remington Arms has designated them with abbreviations in their manufacturing and testing literature. These are:

4.7.1 <u>Unintended Fire on Safety Release - abbreviated "FSR"</u>

This condition occurs when the Connector has been displaced from full engagement with the Sear step as a result of an interference or from improper manufacturing dimensions within the fire control components. When the safety lever is in the "Safe" position, this safety component supports the sear, not the Connector. When the safety lever is moved from "Safe" to "Fire", the unsupported sear immediately drops down, releasing the firing pin, and firing the rifle without a trigger pull. In essence, the safety lever acts as an unintended second trigger when an interference prevents the Connector corner from proper engagement. A second type of unintended firing can occur if the Sear lift distance by the safety lever is too low. When the safety lever is in a mid-position, between "Safe" and "Fire", and the Trigger is pulled, the Connector will not properly re-engage the Sear when the Trigger is released. This also will allow the rifle to FSR. This second type of unintended firing by safety lever movement is called "tricking" by Remington. This, however, is no trick, but a manufacturing defect of the fire control components.

4.7.2 <u>Unintended Fire on Bolt Closure - abbreviated "FBC"</u> and <u>Unintended Fire on Bolt Opening - abbreviated "FBO"</u>

This condition occurs when an interference causes insufficient engagement of the Connector corner with the Sear step and the Connector fails to securely support the Sear. When the bolt handle is moved from its rest position, either closing an open bolt (FBC) or opening a closed bolt (FBO), the insufficient engagement allows the Connector to dislodge and unintendedly fire the rifle without a trigger pull. This discharge can occur with only a minor mechanical disturbance of bolt movement.

4.7.3 <u>Unintended Fire from Normal Rifle Jarring - abbreviated "Jar Off"</u>

This condition occurs when an interference causes insufficient engagement of the Connector corner with the Sear step and the cocked rifle is impacted by a force during its use. The cocked rifle, with the safety lever in the "Fire" position, is unintendedly fired as the vibrations and inertial forces associated with the jar to the rifle causes the Connector to loose

engagement with the Sear and allows the firing pin to spring forward and hit a chambered cartridge primer.

4.7.4 Unintended Fire from Bolt Closure without Connector Engagement - abbreviated "Soft Follow Down"

This condition occurs when an interference prevents any engagement between the Trigger Connector and Sear and occurs when the rifle bolt is closed. The rifle, in essence, does not cock and the firing pin goes forward with the closing bolt and impacts the chambered cartridge primer. This condition often does not have enough firing pin energy to fire a chambered cartridge, but its presence is evidence of the failure of the fire control assembly components to operate safely.

4.8 All of the conditions leading to unintended firings of the Remington 700 rifle models with Walker triggers, as listed in Paragraph 1.7 above, are allowed to occur because this fire control design includes a Trigger Connector that does not reliably return to full engagement with the Sear each time the rifle bolt is cocked. The Walker trigger is the only fire control assembly used in a consumer rifle that has a Trigger Connector component. Remington Arms, through the large amount of engineering and testing data produced, is clearly aware that the insufficient engagement of the Walker fire control Connector is a root cause in unintended firings of Remington Model 700 rifles that discharge without trigger pull.

4.9 The Walker fire control Trigger Connector does not benefit the performance of the Walker fire control. Other manufacturers' fire controls, without connectors, provide the same trigger performance. The only manufacturing benefit of the Connector is cost reduction. By the use of a trigger connector, the trigger body itself requires no further machining of its engagement corner. The Walker fire control was conceived for the target shooter or highly experienced shooter, but Remington produced it in rifles intended for hunters and recreational shooters. Remington advertised the Model 700 rifle for use by hunters and other common users of the rifle, never restricting it to target or highly experienced users only.

5.0 Introduction of the Remington X-Mark Pro Fire Control

5.1 Beginning in 2006, Remington Arms installed newly designed fire controls on some of its bolt action rifles, the Model 700 and Model Seven rifles. The new fire control was called a "Safety Pivoted Link" (SPL) fire control design and was marketed by Remington as the X-Mark Pro (XMP) fire control.

5.2 This fire control, like the Walker fire control, was a sear-override design fire control with some major differences. The Trigger Connector component was eliminated, thus eliminating the potential for debris or other interference between the Trigger Body and the Trigger Connector. The new XMP fire control contained an addition component called a Blocker

that worked in conjunction with the safety lever. The Blocker is a steel lever component with an adjustable screw set in correct position by the manufacturer. When the safety lever is moved from the "Fire" position to the "Safe" position, the Blocker Screw pushes the top of the trigger rearward to engagement under the Sear and blocks the movement of the Trigger. With the addition of the Blocker, the fire control is assured of the presence of proper Trigger / Sear engagement when the safety lever is moved to the "Fire" position, eliminating the "Fire on Safe Release" behavior. Therefore the X-Mark Pro fire control has two different types of safety systems activated by the safety lever, 1) a lifting of the sear and its mechanical support by the safety lever, and 2) the forced correct engagement distance of the trigger and its mechanical block. This redundant safety is superior to the Walker fire control safety system.

5.3 Figures 4 and 5 below show the location of the Blocker Screw. This screw is installed on a separate lever that is moved forward and rearward by the movement of the two position safety lever.

5.3.1 When the safety lever is moved to the "Safe" position, the Blocker Screw moves rearward and pushes the top of the Trigger into engagement under the Sear. This Blocker Screw contact with the Trigger also keeps the Trigger from moving from its engagement position until the Blocker Screw is moved forward.

5.3.2 When the user is ready to shoot a rifle with an XMP fire control, he moves the safety lever to the "Fire" position. This action moves the Blocker Screw away from contact with Trigger, allowing the Trigger to be pulled, releasing the engagement, and allowing the Sear to fall and the rifle to fire.

5.4 A similar functioning but different design fire control was also created by Remington for its Model 770 rifles. The M770 rifle has polymer components as part of its fire control housing and necessitated a fire control design that was a variance from the XMP. This M770 fire control, like the XMP, also eliminated the Trigger Connector and provided a sliding portion of the fire control housing coupled to its safety lever. When the safety lever was placed in the "S" or "Safe" position, this Blocking Slide pushed the Trigger into engagement under the Sear and prevented Trigger movement until the safety lever was moved to the "Fire" position. Figures 6 and 7 show the new design fire control as-installed on an exemplar Remington M770 rifle, S/N M71804075, manufactured in 2012. This exemplar rifle was purchased locally at a vendor in Norman, Oklahoma. The new M770 fire control, like the X-Mark Pro for the M700 rifles, has the two safety systems to block the firing mechanism when the mechanical safety is placed in the "S" position: 1) the safety lifts and holds the sear upward, preventing its movement, and 2) the blocker screw blocks the trigger in the full engagement position until the safety is placed in the "F" position. The Walker fire control does not have this second blocking safety feature. This newly designed M770 fire control is a safe replacement for the M770 Walker fire control and can be retrofitted not only into M770 rifles, but also equivalent rifle models M710 and M715 rifles that also were originally manufactured with Walker triggers.

5.5 After its original introduction, the Remington XMP fire control also added a non-sealed adjustment screw for trigger pull force adjustment by the user. This adjustment feature was added in approximately 2008. This screw allowed the adjustment of trigger pull force between approximately 3- 6 pounds force. A separate internal trigger force spring prevented the trigger pull force from being reduced below 3 pounds.

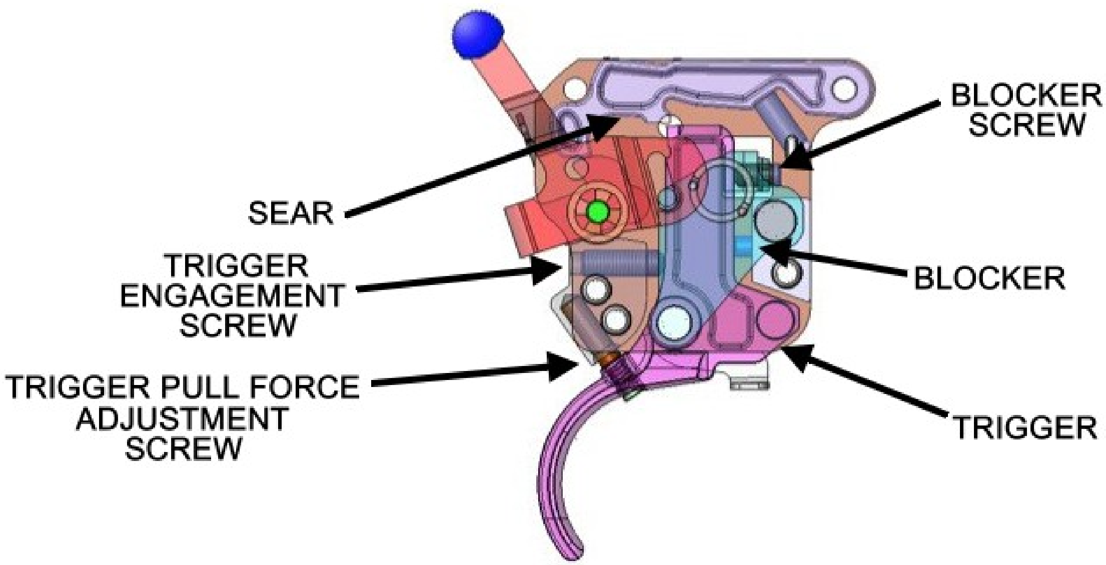

Figure 4

An overall schematic of the Remington X-Mark Pro (XMP) fire control. This fire control design eliminates the Trigger Connector used in the Walker fire control. This XMP design adds a Blocker lever and Blocker screw that act in conjunction with the safety lever to insure engagement between the Trigger and Sear as well as blocking the Trigger from loosing engagement while the safety lever is in the "Safe" position.

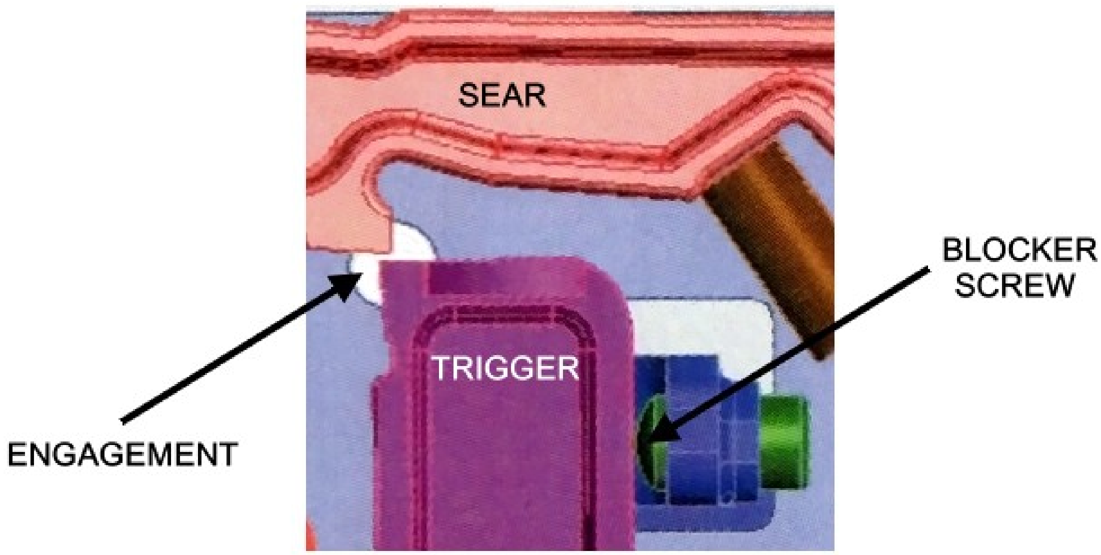

Figure 5

This Figure is a closer view of the engagement between the Trigger and the Sear in the XMP fire control system. The Blocker Screw (green) pushes on the forward top of the Trigger when the safety lever is in the "Safe" position. This forces the correct sear/ trigger engagement and prevents the Trigger from moving and potentially reducing the engagement until the safety lever is moved to the "Fire" position.

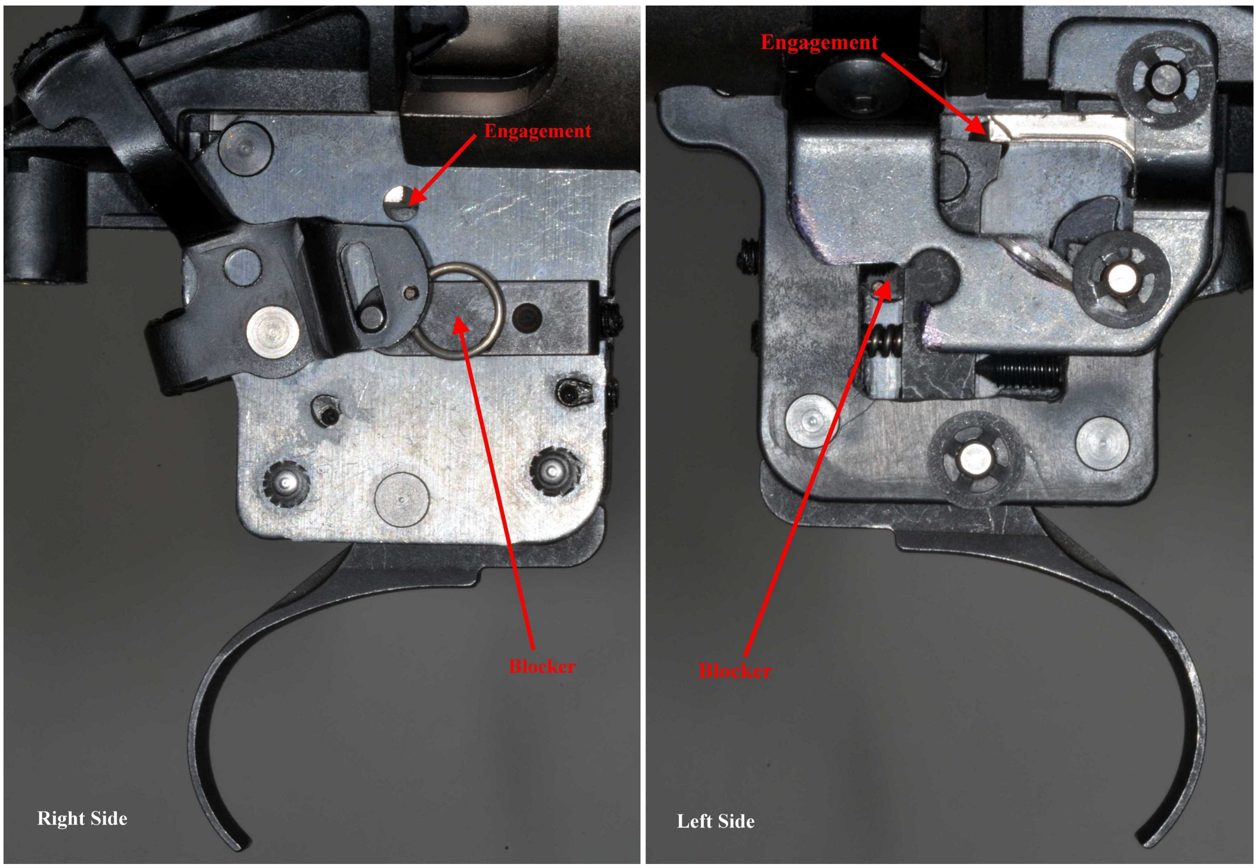

Figure 6

Photographs of the Right and Left sides of the M770 fire control with the same features as the M700's X-Mark Pro design. The Left side of a M770 fire contol housing is a polymer component. In this rifle, the Left side housing has had windows machined into it to reveal the movement of the internal fire control components. This fire control's trigger has no connector and has a sliding Blocker engaged in a mechanical linkage with the Safety Lever. The Blocker is shown in these photos that maintains a safe engagement beneath the Sear

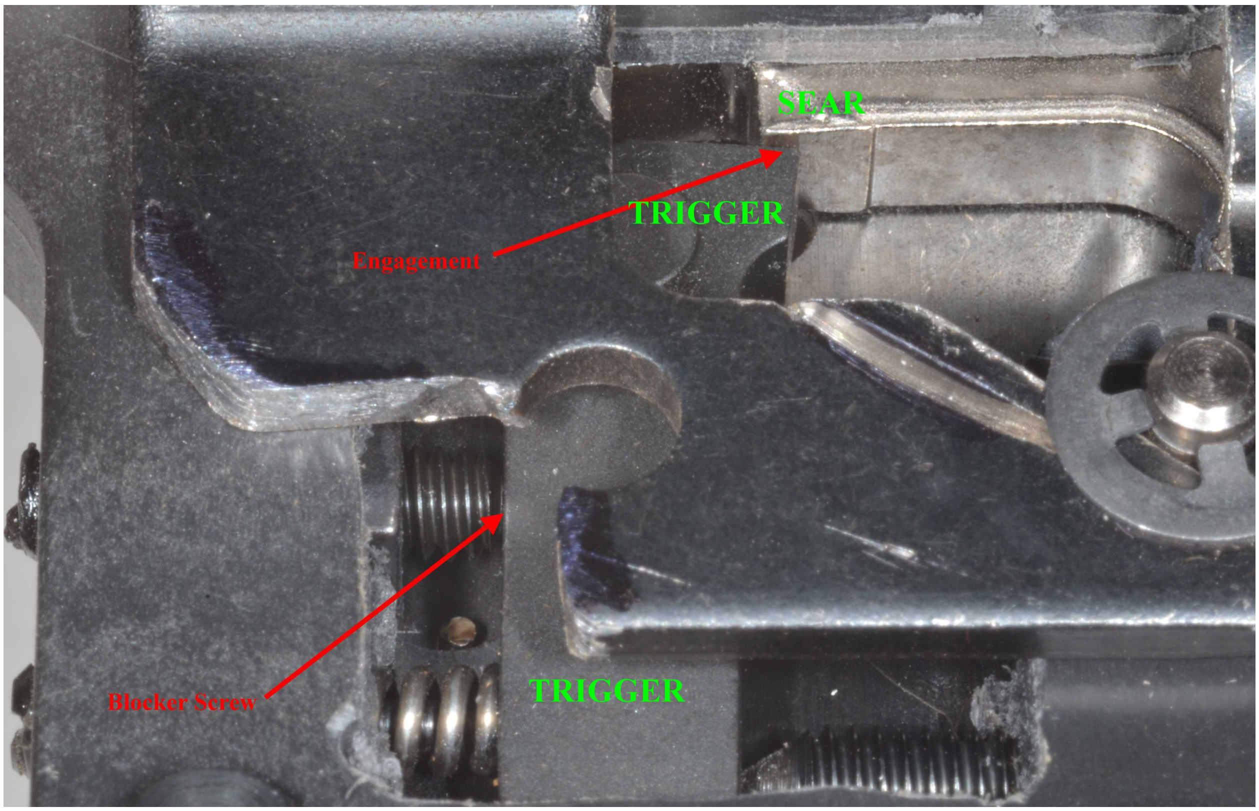

Figure 7

In a closer photograph the same safety features from the X-Mark Pro design can be observed in the M770 fire control design. When in the safety lever is placed into the "S" position, the trigger is pushed into proper Engagement under the sear with the Blocker Screw. The Blocker Screw remains in place, blocking the movement of the trigger, until the mechanical safety lever is placed in the "F" position, moving the Blocker screw forward and allowing the trigger to be pulled to fire the rifle.

6.0 Manufacture of the XMP Fire Control by Remington Arms

6.1 The XMP fire control, like the Walker fire control, is composed of a number of components installed into a housing. These components include levers, pins, springs, and screws, as well as the Sear, Trigger, Safety Lever, and Blocker. The manufacture of all these components to close tolerances and their correct assembly and sealing is critical to manufacturing a safe XMP fire control with as-designed performance. Remington has the correctly manufactured components provided in lots to their individual assemblers. These assemblers install, adjust, inspect, and seal all fire control components at assembly benches in the Remington facility. Because of the small tolerances and engagement distances, the triggers are adjusted under magnification on optical comparators.

6.2 On July 08, 2014, I accompanied Remington attorney Mr. Dale Wills, Remington Engineer Mr. Derek Watkins, and Plaintiff attorneys Mr. Tim Monsees and Mr. Judd Waltman through the assembly and testing of Remington X-Mark Pro fire controls, both those of new manufacture and those that had been removed from previously assembled rifles that were being re-worked. Figure 6 shows a typical assembly and inspection station at the Remington facility in Ilion, New York, on the date of my evaluation.

6.2.1 In 2014, Remington issued a voluntary Product Safety Recall on all XMP fire controls manufactured from May 1, 2006 through April 9, 2014. It was determined by Remington that those XMP fire controls in the recall group had not been correctly manufactured.

6.2.2 In a presentation by Remington on July 08, 2014, it was explained that the Blocker Screw on the XMP fire control was adjusted during original manufacture to provide correct engagement when pressing against the Trigger and then sealed in place with a clear thread locking compound, Loctite 660. During original assembly, Remington assembly personnel applied the Loctite 660 in such a fashion that excessive Loctite 660 remained within the fire control housing and could leave a wet film on the Trigger surface. In certain low temperature conditions within the operating range for the rifle, the Blocker Screw could "stick" to the Trigger when the safety lever was placed in the "Safe" condition. When the safety lever was next moved to the "Fire" position, the stuck Blocker Screw pulled the Trigger out of engagement with Sear and allowed the firing pin to move forward under spring action. This action would cause a Fire on Safe Release (FSR) that could cause an unintended discharge of the rifle. Additionally, this excessive polymer material within the fire control housing could result in other interferences that could affect fire control performance or engagement. Loctite thread blocking materials were never used during the manufacture of Remington Walker fire controls.

6.3 After the discovery of the excessive Loctite 660 in the XMP fire controls and the recall of all XMP fire controls, Remington instituted a number of manufacturing changes and additional inspections to detect any future manufacturing problems of the XMP fire control. These are:

6.3.1 Replacement of the Loctite 660 thread blocker liquid which is clear with Loctite 263 thread blocker liquid which is colored red. The red color makes it easy to see if any Loctite is in any other location within the fire control housing other than its proper location on the Blocker Screw.

6.3.2 Remington fire control assemblers now use precise positioning of the Loctite 263 on the Blocker Screw thread surfaces with a micro-needle applicator and a partial shield on the screw when the Loctite is applied. It was stated that by keeping the red Loctite off the end of the Blocker Screw, any excess Loctite is forced toward the outside of the housing and not toward the inner end of the Screw.

6.3.3 When I viewed the assembly of the XMP fire controls by Remington, they were still placed on the magnifying optical comparator and adjusted until the engagement distance was set. Remington demonstrated a new machine vision adjustment stand that utilized a digital camera system to easily adjust these distances. Figures 8 through 12 below show the two different types of adjustment mechanisms. The viewablilty of the the newer digital camera system appears very good and its software helps the assembler to correctly adjust the engagement distance between the trigger and the sear.

6.3.4 After adjustment of the XMP springs and screws, each fire control is microscopically inspected at a digital video workstation at 50X. Any excess red Loctite within the fire control housing is easily viewed and removed with small swabs by the inspector. These inspectors can also reportedly send any fire control back for re-assembly as a result of detected discrepancies by the microscopic inspection system.

Figure 8

A typical assembly line station at the Remington facility, Ilion, New York, on July 08, 2014. The fire control assemblers have ready access to parts and Loctite for assembly. The assembly benches are well lit and clean for easy installation of all the components of the fire control.

Figure 9

Adjustment of XMP fire control on optical comparator.

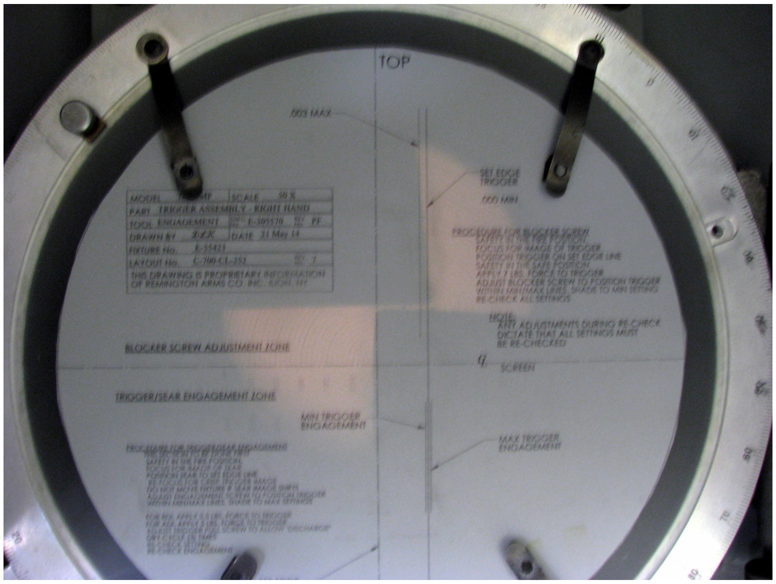

Figure 10

A view of the optical comparator screen shown in Figure 7. The tolerances and adjustment positioning is recorded on each inspection screen.

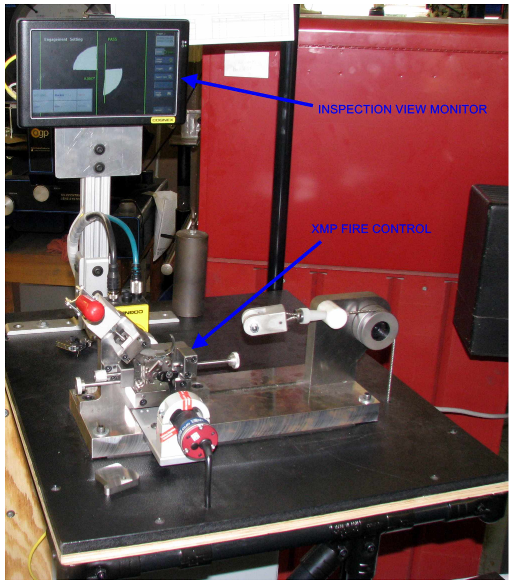

Figure 11

A view of the newly installed machine vision / digital camera system for the adjustment of the XMP fire controls by Remington

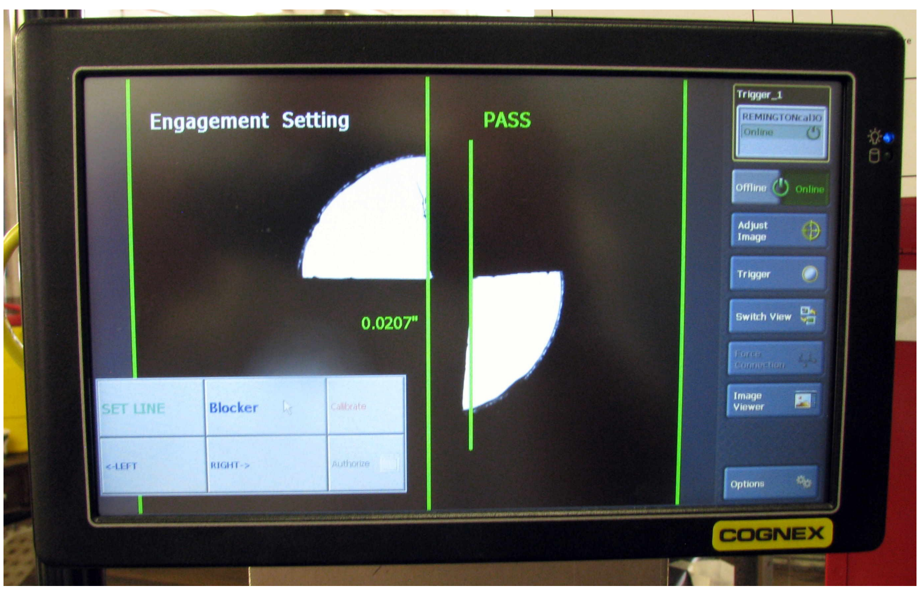

Figure 12

A view of the inspection monitor on the digital camera system shown in Figure 9. The inspection software helps the Remington assembler in determining the proper assembly distances and sear engagement.

6.4 After curing the Loctite for 24 hours, the XMP fire control has its adjustment screws sealed with a liquid polymer cement and has graphite blown into the fire control housing for smooth engagement of the Trigger and Sear. The assembled fire controls are then assembled to barrel/receiver assemblies and the final trigger pull force and sear lift is set with each rifle's individual bolt. Gallery testing fires test cartridges through each rifle for function testing and proof testing.

6.5 At the time of the July 8, 2014 inspection, Remington was also rebuilding the XMP fire controls returned in the voluntary recall program. If an XMP fire control is on a rifle returned from a consumer as a result of the recall program, the fire control is tagged with a code matching the rifle it came from when it is removed. It was explained by Remington that many of their customers wanted the exact fire control sold with the rifle to be returned to the same rifle. If an XMP fire control is on a rifle returned from a vendor, not a consumer, then the fire control is removed and not tagged with a code. Remington also stated that periodically they rejected returned XMP fire controls for any conditions that could have affected the performance or safety of the rifle. If rejected, then a new XMP is substituted for the rejected one.

6.6 The XMP fire controls returned in the recall program have their internal components disassembled from their housings, using heat to loosen the thread blocking compounds. The housing and major components are ultrasonically cleaned and new springs and screws used during their reassembly. The assembly, inspection, and testing of these refurbished XMP fire controls, before and after re-installation on the matching rifle, is the same as those used for a new fire control. The re-manufactured XMP fire controls are therefore equivalent in terms of safety and performance as the newly manufactured XMP fire controls utilizing the improved assembly and inspection process.

6.7 It was recently reported that Remington now has sufficient newly assembled XMP fire controls in-house and will begin to replace all returned XMP fire controls with new ones instead of rebuilding them.

6.8 The Remington assembly and inspection process is dependent on the capability and diligence of their assembly and inspection personnel. Remington has designed the assembly process to be logical and easily understood. The training of the assembly and inspection personnel was reported to be on the job with other senior personnel. A step-by-step procedure card with graphic display of tasks was observed at each work station I toured.

6.9 Remington utilizes a manufacturing technique termed metal injection molding (MIM) for the production of components of the XMP fire control.

6.9.1 MIM is a method of manufacture of small complex parts from molded powdered metals that are consolidated, sintered, and case hardened into a dense metal component. Two of the XMP fire control components that are manufactured by MIM are the

trigger and sear.

6.9.2 Some have criticized the use of MIM for the manufacture of fire control components. However, greater uniformity of shape and material properties are produced from MIM fire control components over individually machined components. MIM components are all formed from the same high precision machined mold. That mold is created by highly skilled machinists using precision machining and grinding equipment. A manufacturer is far less likely to make a machining mistake in creating the single MIM mold than in the individual machining of thousands of fire control components. Each MIM component is a duplicate of its precision mold and the effects of machine variations, cutter wear, machinist differences, etc. are eliminated.

6.9.3 Many people confuse MIM components with those manufactured by press / sinter type powder metallurgy techniques. Powder metallurgy is an older technology that creates components from large irregular particle size powders, lower sintering temperatures, greater final porosity, and a reduction of physical properties of that alloy material. MIM components are very different. MIM components are created from small spherical metal powders approximately 10 times smaller than powder metallurgy particles. MIM components are sintered at higher temperature for a much longer time. This creates almost no porosity in the dense finished component and material properties at the same handbook level as those same alloys created by traditional techniques (Reference 1 to this report). In the two important Remington XMP fire control MIM components, the sear and trigger, the components are additionally heat treated and case hardened to increase their surface hardness and core strengths.

6.9.4 Correctly manufactured MIM components have good hardness and strength properties and are appropriate for use in fire controls. Many firearms manufacturers besides Remington use this manufacturing technique for fire control components. I have seen no evidence to date that a MIM component that was correctly manufactured compromised the safety of any fire control, including the X-Mark Pro. I have found no evidence that correctly manufactured MIM components in the XMP fire control have been responsible for any unintended firings of a Remington bolt action rifle.

7.0 Testing and Conclusions

7.1 I have examined three different XMP fire controls, each obtained from a non-Remington source. All three are subject to the current Remington Product Safety Recall but have not yet been submitted for repair. All three fire controls exhibit some clumping of the graphite dust around the Blocker Screw, indicating excessive Loctite on the threads, but none of the exemplar XMP fire controls exhibited liquid Loctite on the front top of the trigger. All three exemplars exhibit appropriate engagement, safety lift, and overtravel dimensions as received. All worked well on the rifles they were installed on :

Exemplar 1 - Purchased new from firearms supply company Brownell's. This fire control was sold as a new replacement part to be installed by a gunsmith. The trigger pull force adjustment screw was not sealed by the manufacturer, awaiting final adjustment and sealing by a gunsmith. This fire control was installed on Remington Model 700 ML rifle (1998) S/N ML226434. Its measured values were:

Trigger Pull Force - 4.8 - 5.8 lbs
Sear Engagement - .020"
Sear Safety Lift - .014"
Trigger Overtravel - .007"

Exemplar 2 - Purchased without a rifle in an online auction. This fire control was installed on Remington Model 700 rifle (1997), S/N S6322245. This fire control has a user adjustable trigger force screw. The fire control was tested as received. Its measured values were:

Trigger Pull Force - 5.9 - 6.3 lbs
Sear Engagement - .021"
Sear Safety Lift - .010"
Trigger Overtravel - .011"

Exemplar 3 - Purchased new with Remington Model 700 rifle (2012) S/N RR78763A. This fire control has a user adjustable trigger force screw. The fire control was tested as received. Its measured values were:

Trigger Pull Force - 4.6 - 5.3 lbs
Sear Engagement - .021"
Sear Safety Lift - .015"
Trigger Overtravel - .014"

7.2 The Exemplar 3 XMP fire control as-installed in its new M700 rifle was dry fired 1000 times and live fired 100 times to examine the use characteristics of the MIM trigger and sear used in the XMP fire control. One dry-fire cycle consisted of 1) opening the rifle's bolt with the safety lever in the "F" position; 2) closing the bolt; 3) moving the safety lever from the "F" position to the "S" position and then back to the "F" position; 4) pulling the rifle trigger to dry fire the rifle. The Exemplar 3 XMP fire control was not lubricated during this testing. At approximately 800 dry fire cycles, the rifle bolt was field stripped, cleaned, and lubricated in accordance with the Remington Owners Manual, as a result of bolt/firing pin head stiffness. The reassembled bolt was restored to the rifle and the testing completed.

7.2.1 After dry firing and live firing the Exemplar 3 rifle, the XMP fire control

was removed from the rifle and the fire control was ultrasonically cleaned in acetone for 15 minutes to dissolve sealants and disassembled to remove the trigger and sear components. For a comparison, the Exemplar 1 XMP fire control was also similarly disassembled. The Exemplar 1 XMP had never been live fired and had been dry cycled less than 50 times since its original purchase from Brownell's.

7.2.2 The photographs below show the Exemplar 3 XMP fire control as-disassembled, with its sear and trigger lying in their installation relationship on top of their housing. The engagement corner of the trigger and sear for the Exemplar 1 and Exemplar 3 XMP fire controls are also shown at higher magnification. Some burnishing and smoothing of the metal surfaces are noted from the cycling of Exemplar 3 components, but no significant wear was created that would affect the safe functioning of the components.

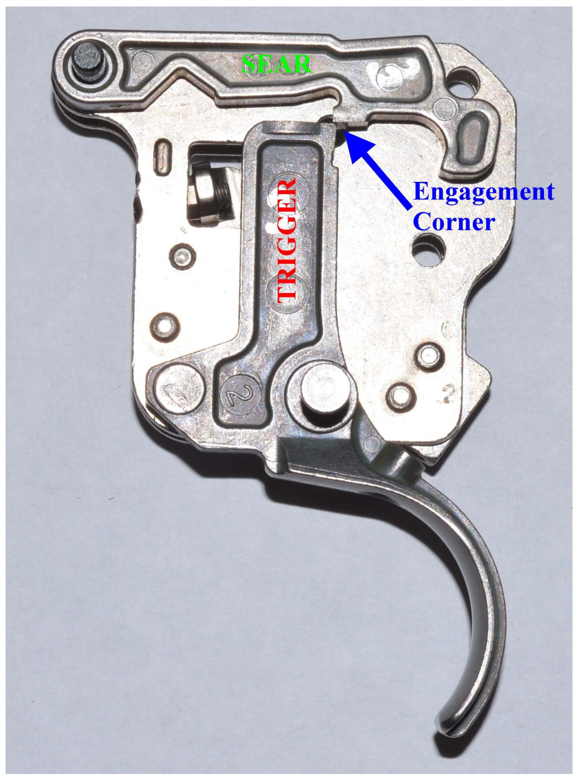

Figure 13

A photograph of the Exemplar 3 XMP fire control housing with its Sear and Trigger lying on top of the housing. The Engagement Corner designated with the blue arrow is shown at magnification in Figures 15 and 17 below.

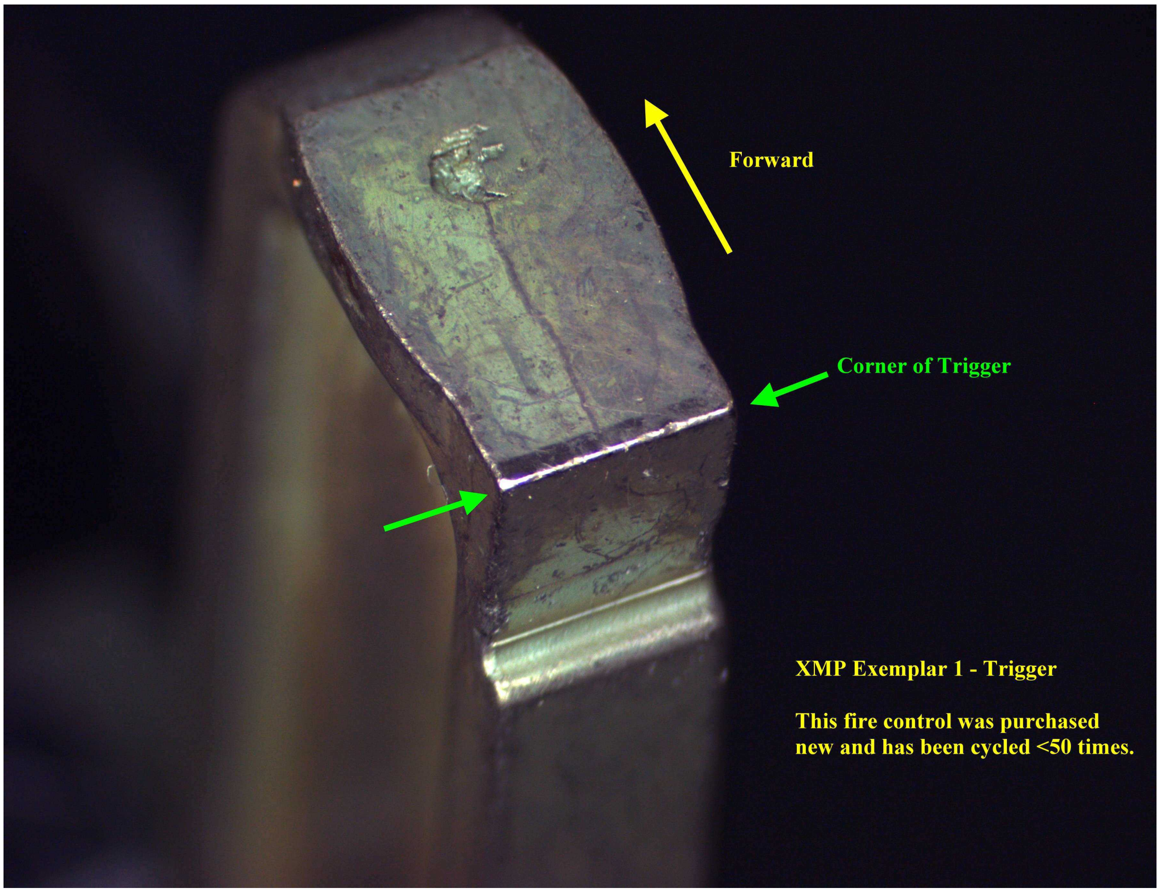

Figure 14

Engagement Corner of the little used XMP Exemplar 1 Trigger

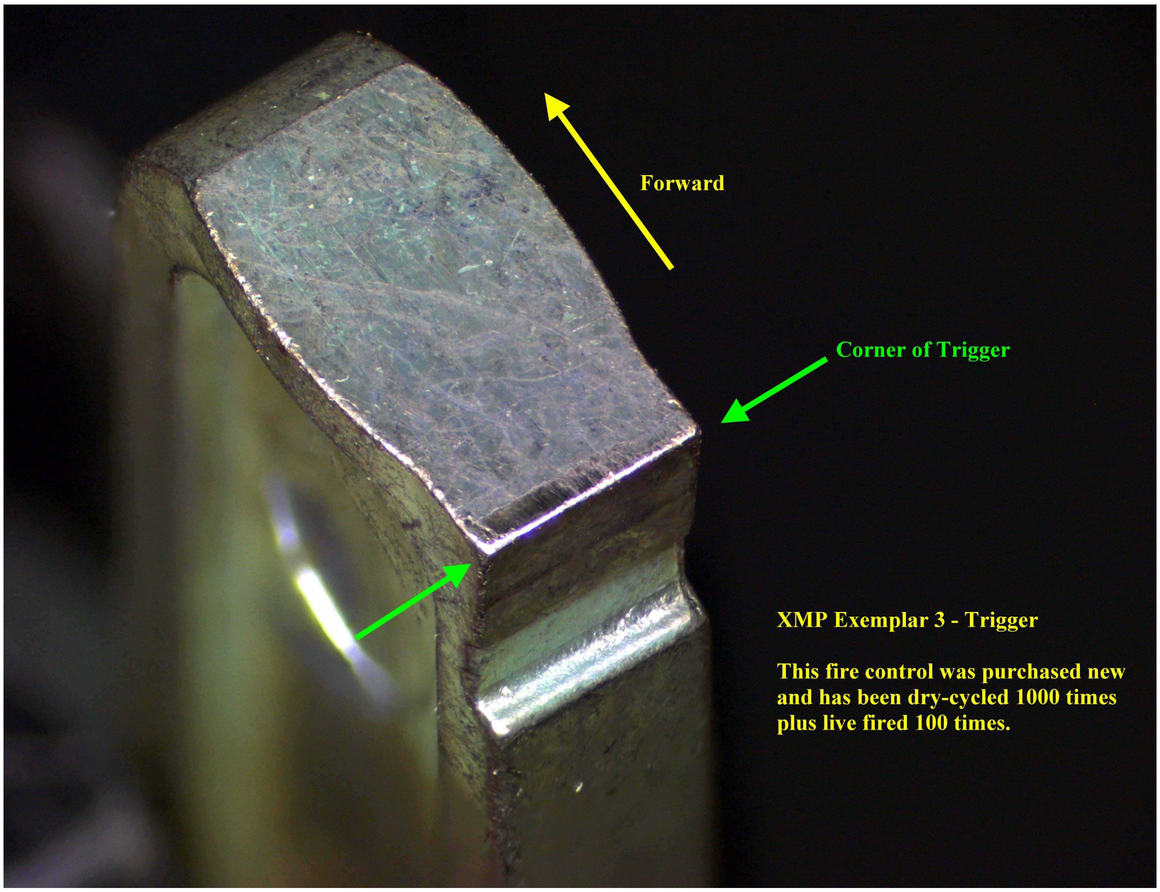

Figure 15

A magnified view of the Engagement Corner on the XMP Exemplar 3 trigger after testing. Little wear is noted.

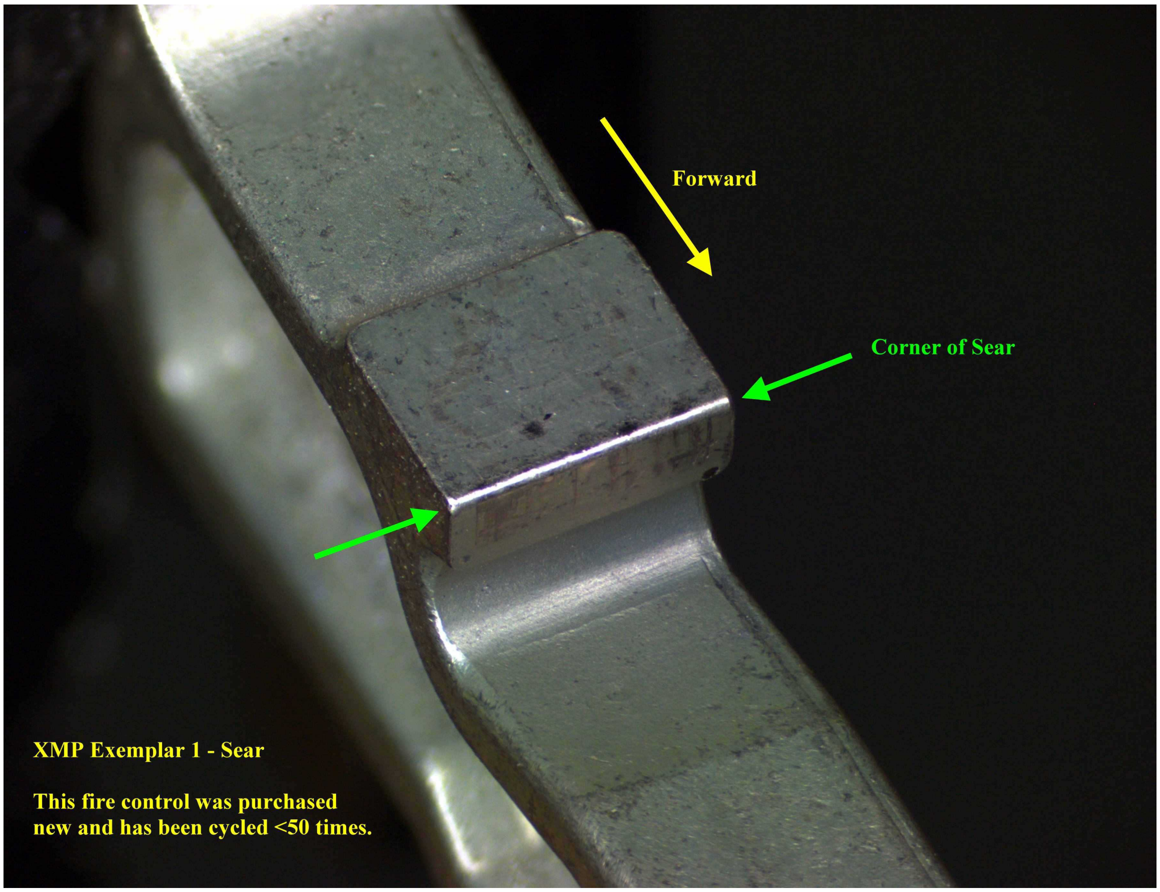

Figure 16

This is a magnified photograph of the Engagement Corner on the XMP Exemplar 1 Sear with little use.

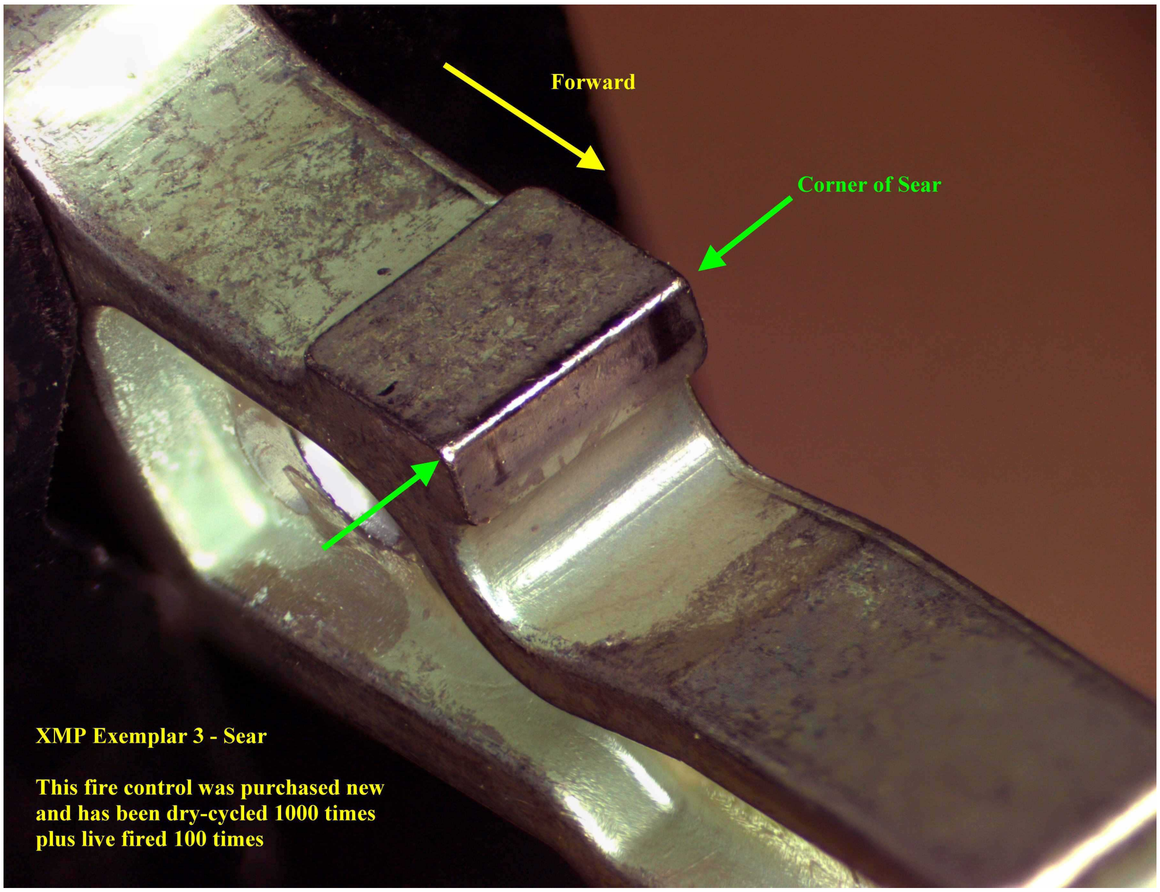

Figure 17

A magnified view of the Engagement Corner on the XMP Exemplar 3 sear after testing. Little wear is noted.

7.2.3 The measured values from the Exemplar 3 fire control pre-test and post-test are shown below:

Pre-Test

Trigger Pull Force - 4.6 - 5.3 lbs
Sear Engagement - .021"
Sear Safety Lift - .015"
Trigger Overtravel - .014"

Post-Test

Trigger Pull Force

Measured Trigger Pull Force: 4.36, 4.08, 4.20, 4.22, 4.26, 4.54, 4.58, 4.00, 4.14, 4.02 lbs.
Average: 4.24 lbs. Standard Deviation: .20

The slight decrease in Trigger Pull Force from the Pre-Test trigger pull force range is attributable to the burnishing and smoothing of the fire control components through use. This rifle's Trigger Pull force range was easily returned to its Pre-Test trigger pull force values by adjustment of the user's adjustment screw provided by the XMP design. Remington Arms reported that after 5,000 dry-fire cycles, the Trigger Pull Force for the XMP increased by approximately .5 pounds.

Sear Engagement

Microscopically Measured Sear Engagement: .024, .024, .023, .023, .023 inches
Average: .023 inches Standard Deviation: .0006

The slight increase in Sear Engagement would provide greater safety from firearm operation and impact jarring.

Sear Safety Lift

Microscopically Measured Sear Safety Lift: .013, .013, .014, .014, .013 inches
Average: .013 inches Standard Deviation: .0006

The slight decrease in Sear Safey Lift has no affect in the safety or performance of the XMP fire control. The minimum value for Sear Safety Lift in the XMP fire control is .008 inches.

Trigger Overtravel

Microscopically Measured Trigger Overtravel: .022, .021, .024, .024, .023 inches
Average: .023 inches Standard Deviation: .001

The slight increase in the Trigger Overtravel has no effect on the safety of the XMP fire control system. Trigger Overtravel distance must be present in some value greater that about .010 inches to allow the trigger to clear the sear corner when the trigger is pulled.

7.3 I have reviewed four test studies conducted by Remington Arms from 2007 – 2009. Each test program consisted of dry cycling a number of XMP fire controls for up to 10,000 cycles and live firing the test fire controls for up to 5,000 rounds each. Some test rifles were additionally drop tested and jar-off tested. No trigger or firing related problems or malfunctions were recorded in any of the test XMP fire controls. All XMP fire controls passed all the test parameters. After 10,000 dry fire cycles, Remington reported that the Trigger Pull Forces increased slightly by about 1 pound and that the Sear Safety Lift distances held very steady from their pre-test values.

7.4 The Remington X-Mark Pro fire control design is a safe alternative to the Walker fire control. It can be retro fitted to older Remington rifles without affecting its performance or safety. The XMP fire control design eliminates the Connector from its design and adds a trigger blocking safety mechanism that reestablishes a safe engagement every time the safety lever is moved to the "Safe" position as well as blocking the trigger from movement while the safety lever is in "Safe".

7.5 Remington has the in-house capability to correctly manufacture and assemble the XMP fire control. The Remington changes to their assembly procedure and 100 per cent microscopic inspection of all future XMP fire controls should insure that errors by their personnel are prevented.

7.6 I have reviewed different fire control system designs for bolt action rifles by other manufacturers such as Savage, Marlin, Weatherby, and Winchester. The designs have different ways to create a safe and well performing fire control. For example, some Savage models, Marlin models, and the Remington Model 783 bolt action rifle have a central "blade" in the trigger that must be pulled before the trigger can be depressed, even when the rifle's safety is in the "Fire" position. If, as in the manufacture of the XMP, the Trigger / Sear engagement is correct when the safety lever is moved to "Fire", then the XMP will fire only when the trigger is pulled, just like those other designs.

Further, Affiant sayeth not.

CHARLES W. POWELL

Subscribed and Sworn to before me this

26th day of January, 2015.

Karen Powell
Notary Public

NOTARY PUBLIC OKLAHOMA
KAREN POWELL
Notary Public
State of Oklahoma
Commission # [illegible]009579
My Comm. Expires 10/21/201[illegible]

Reference

Reference 1 - Metal Injection Molding, R.M. German, Metal Powder Industries Federation (MPIF), Princeton, New Jersey, 2011, p 1-10.

Exhibit A

Curriculum Vita of Charles W. Powell PE

CURRICULUM VITAE

Charles W. Powell PE
Support Services Engineering Corporation
3360 Allspice Run
Norman, Oklahoma 73026
(405) 321-0916 FAX (405) 321-3012 charlespowell@sbcglobal.net

Engineering Rates: $175 per hour.
Vita Date: June 1, 2014

CURRENT PROFESSIONAL ACTIVITIES

Accident investigation and engineering failure analysis of products and structures.

Product evaluation, materials selection, and design improvement as applied to industrial processes and consumer products.

Physical metallurgical aspects of material failures.

Development of forensic scanning electron microscopy (SEM) and x-ray elemental analysis for the characterization of material fractures, surface deposits, and microscopic fragment analyses.

Application of advanced nondestructive evaluation techniques for product in-service reliability, structural integrity, and component design.

PROFESSIONAL BACKGROUND

Registrations

Registered Professional Engineer, State of Oklahoma PE Number 12501 Active
Registered Professional Engineer, State of Alabama PE Number 28210-E Active

Level III Certification - Nondestructive Testing (general methods, magnetic inspection, ultrasonic inspection, penetrant inspection). The American Society for Nondestructive Testing Certification Number GV-764. Inactive

FAA NDE Repairman, Certification No. 2380799 (1979-1989) Inactive

Patents

United States Patent No. 4,989,357 **Muzzleloader Safety**
Patent Date: February 5, 1991 (with J. W. Norman)

Abstract: A safety assembly for use with firing weapons is provided. The safety assembly may be selectively positioned between an on position and an off position. In the on position, the safety assembly prevents the hammer of the firing weapon from pivoting from a firing position to a fired position. In the off position, the safety assembly permits the hammer of the firing weapon to fall from the firing position to the fired position.

Professional History

1986 - Present
Support Services Engineering Corporation, 3360 Allspice Run, Norman, OK.

President, CEO

Support Services Engineering Corporation (SSEC) is a consulting engineering company specializing in materials failure analysis, accident investigation, and materials evaluation.

1987 - 1995
Federal Aviation Administration, U. S. Department of Transportation, Mike Monroney Aeronautical Center, Oklahoma City, OK.

FAA Academy Instructor. Nondestructive testing, Identification of Material Discontinuities, and Certification of FAA Repair Stations and NDE Inspectors.

1978 - 1989
Engineering and Materials Technology Corporation (EMTEC), 3511 Charleston Road, Norman, OK.

1988 - 1989 Corporate President and CEO
1978 - 1988 Project Director; Director of Nondestructive Evaluation.

EMTEC is a materials testing and evaluation laboratory with capabilities in physical materials testing, light and electron microscopy, nondestructive testing, and failure analysis.

1981 - 1982
Oklahoma City Community College, Natural and Applied Sciences, Oklahoma City, OK.

Adjunct Professor, Natural and Applied Sciences. Metallurgy, Welding and Joining Curriculum.

1977 - 1978
Oklahoma City Air Logistics Command, Physical Sciences Laboratory, Tinker Air Force Base, OK.

GS-11 Metallurgist, Failure Analyst

Failure analysis and quality control of aircraft engine components, airframe components, and jet engine rebuilding processes. Extensive experience with high performance structural materials design and high temperature alloy materials.

1976 - 1977
University of Oklahoma, School of Materials Science, Norman, Oklahoma

Graduate Teaching Assistant in Metallurgical Engineering

Courses Taught: "Structure and Properties of Materials"; "Physical Metallurgical Laboratories".

1974 - 1976
U. S. Army, Company A, 43rd Engineer Battalion (Combat), Ft. Benning, GA.

First Lieutenant, Honorable Discharge.

Executive Officer, Acting Company Commander, responsible for upper division maintenance of combat battalion engineering equipment and command of post support civil engineering projects. Company A was the top rated Engineering Group Company (Top three in the continental United States) during tenure. Radiological/Chemical/Bacteriological Officer.

Education

University of Oklahoma, College of Engineering, Bachelor of Science Degree in Metallurgical Engineering, 1974.

University of Oklahoma, College of Engineering, Course work completed for Master of Science

Degree in Metallurgical Engineering. 1976 - 1977.

Lehigh University, Short Course in Fracture Mechanics, 1977.

Professional Offices and Affiliations

American Society for Metals (ASM International)
Central Oklahoma Chapter
Chapter Chairman (1980 - 1981), (1984 - 1985)

American Society for Testing and Materials (ASTM International)
Committee E58 Forensic Engineering
Committee F8 Sports Equipment and Facilities

Historical Metallurgical Society (HMS)
National Association of Corrosion Engineers (NACE)
National Society of Professional Engineers (NSPE)
National Rifle Association (NRA) including NRA certificate – Metallic Reloading
Society of Automotive Engineers (SAE)

Honors

Moderator - Government Procurement
<u>Oklahoma Conference for Small Business</u>
Oklahoma City, Oklahoma July 1987.

Oklahoma Delegate
<u>White House Conference on Small Business</u>
Washington, D.C. August 1986.

University Scholar, University of Oklahoma

Gulf Merit Scholar, University of Oklahoma

NSF Undergraduate Research Scholarship, University of Oklahoma

PUBLICATIONS AND INVITED LECTURES

"Effects of a Carbonaceous Overlayer on the Auger Spectra from Selected Stainless Steels", 61st Annual Meeting, Oklahoma Academy of Science, Central State University, Edmond, Oklahoma, 1972.

"Metallurgical Analysis of Drill Pipe and Vena Caval Implants Using SEM/XES", 67th Annual Meeting, Oklahoma Academy of Science, Oklahoma State University, Stillwater, Oklahoma, 1978.

"Detrimental Sigma Phase Formation in a Jet Engine Turbine Blade", 67th Annual Meeting, Oklahoma Academy of Science, Oklahoma State University, Stillwater, Oklahoma, 1978.

"Investigation of Ranger I (offshore mobile drilling platform) Collapse - Metallurgical and Fracture Analysis", OTC 3742, Proceedings of 12th Annual Offshore Technology Conference, Houston, Texas, 1980.

"Principles of Accident Investigation", Seminar Instructor, EMTEC Corporation, Norman, Oklahoma, 1982.

"Utilization of the Scanning Electron Microscope for Forensic Materials Evaluation", invited keynote speaker, 72nd Annual Meeting, Oklahoma Academy of Science, Oral Roberts University, Tulsa, Oklahoma, 1983.

"Evaluation of Metallurgical and Imprint Evidence Created During a Tractor/Trailer and Automobile Impact", the American Academy of Forensic Sciences, 47th Annual Meeting, Las Vegas, Nevada, 1985.

"Investigation of Defective Tank Construction". American Academy of Forensic Sciences, 47th Annual Meeting, Las Vegas, Nevada, 1985.

"Plastic Carbon Replication Techniques for Transmission Electron Microscopy", Oklahoma Society for Scanning Electron Microscopy Spring Workshop, University of Oklahoma, Norman, Oklahoma, 1985.

Exhibit B

Case List Testimony of Charles W. Powell Over The Last Four Years

061001	William Martin v. MTD Products United States District Court, Western District of Oklahoma Case No. CIV-10-520-F Deposition Testimony, Norman, Oklahoma May 16, 2011 Client: Mr. David Bernstein
060601	Richard Cates v. AHL, Inc., dba America Remembers, et al. District Court of Cleveland County, State of Oklahoma Case No. CJ-2006-1474 Deposition Testimony, Oklahoma City, Oklahoma January 10, 2012 Client: Mr. Brad Norman
070305	Phillis Parsons, et al. v Conbraco Industries, Inc.. et a;/ District Court of Harris County, Harris County, Texas 129th Judicial District Court Deposition Testimony, Oklahoma City, Oklahoma April 26, 2010 Trial Testimony, Houston, Texas April 1, 2011 Client: Mr. Don Wheeler
080601	Harry Carlson v Freedom Arms, Inc., et al. County Court at Law No. 3, Dallas County, Texas Cause No. CC-08-04892-C Deposition Testimony, Garland, Texas June 4, 2010 Trial Testimony, Dallas, Texas October 5, 2011 Client: Mr. Grady Chandler
080701	DOC Transportation v. Charlie's Trucking, et al. District Court of Garvin County, State of Oklahoma Case No. CJ-2009-505 Deposition Testimony, Oklahoma City, Oklahoma November 13, 2012 Client: Mr. Scot Rhodes

090705	Michael L. Miller v. Illinois Tool Works, Inc. United States District Court for the Western District of Oklahoma Case No. CIV-09-0644-M Deposition Testimony, Norman, Oklahoma August 26, 2010 Trial Testimony, Oklahoma City, Oklahoma June 14, 2011 Client: Mr. Cliff Naifeh
090905	Jerry Brace v. Polaris Industries and Sanders Sporting Goods & ATVs District Court of Dewey County, State of Oklahoma Case No. CJ-2010-15 Deposition Testimony, Oklahoma City, Oklahoma September 27, 2011 Client: Mr. Duke Halley and Mr. Shane Smithton
091001	Enriqueta Real Leon v National Oil Well Varco LP. v Blue Water Fabricators, Inc. District Court of Kingfisher County, State of Oklahoma Case No. CJ-2009-292 Deposition Testimony, Oklahoma City, Oklahoma July 12, 2011 Client: Mr. Duke Halley
091101	Kevin Scott Bryce v. GRLC, L.L.C. dba Valley Towing Products, et al. United States District Court for the Eastern District of Texas, Marshall Division Civil Action No. 2:10-CV-111 Deposition Testimony, Houston, Texas January 12, 2011 Trial Testimony, Houston, Texas April 1, 2011 Client: Mr. Don Wheeler
100201	Liberty Pressure Pumping, L.P. v. Stewart & Stevenson, LLC, et al. District Court of Johnson County, Texas, 249th Judicial District Cause No. C-2010-00341 Deposition Testimony, Dallas, Texas January 15, 2014 Motion Hearing, Claiburn, Texas September 3, 2014 Client: Mr. Todd Frank and Mr. Bradley Kirklin

100802 Agape Flights, Inc., vs. Covington Aircraft Engines, Inc., et al.
United States District Court for the Eastern District of Oklahoma
Case No. CIV-09-492-FHS
Deposition Testimony, Oklahoma City, Oklahoma
February 28, 2012
Client: Mr. Tim Martin

101201 Kelly Ann Morris, Personal Representative of the Estate of Thomas Shelby Morris v. BoostPower U.S.A., Inc.
United States District Court for the Western District of Oklahoma
Case No. CIV-10-722-M
Deposition Testimony, Oklahoma City, Oklahoma
February 20, 2012
Client: Mr. Mark Cox

110306 Creigh Landis and Brent Landis, Individually, v. Remington Arms, LLC, et al.
United States District Court for the District of New York, Northern Division
Case No. 8:11-CV-1377
Deposition Testimony, Oklahoma City, Oklahoma
September 6, 2012
Client: Mr. Tim Monsees

110307 Jeremy Pope and Kelly Pope v. Great Guns, Inc.
Circuit Court of Clay County, Missouri, at Liberty
Case No. 12CY-CV05930 Division 2
Deposition Testimony, Oklahoma City, Oklahoma
May 20, 2014
Client: Mr. Kirk Presley

111002 Miracle Kayla Parker v. Remington Arms Company, LLC. et al.
United States District Court for the Western District of Tennessee, Eastern Div.
Case No. 1:11-cv-1370-JDB-egb
Deposition Testimony, Kansas City, Missouri
November 27, 2012
Client: Mr. Tim Monsees

120101 Carol O'Neal v. Remington Arms Company, LLC, et al.
United States District Court, District of South Dakota, Southern Division
Case No. 11-4182
Deposition Testimony, Oklahoma City, Oklahoma
January 17, 2013
Client: Mr. Tim Monsees

120301 Brian Freeland & Robin Freeland v. Ameristep, Inc., et al.
District Court of Coal County, State of Oklahoma
Case No. CJ-23
Deposition Testimony, Kansas City, Missouri
February 27, 2014
Client: Mr. Tim Monsees

120303 Jennifer L. Barton v. Pioneer Drilling Services, LTD, et al.
United States District Court, District of North Dakota, Northwestern Division
Case No. 4:11-cv-037
Deposition Testimony, Houston, Texas
July 1, 2013
Trial Testimony, Bismarck, North Dakota
July 9, 2013
Client: Mr. Mel Orchard

120505 Tyson Gurley v. Remington Arms Company
United States District Court for the Northern District of Oklahoma
Case No. 4:13-cv-33-CVE-PJC
Deposition Testimony, Kansas City, Missouri
September 20, 2013
Client: Mr. Tim Monsees

120701 James Mathis and Peggy Mathis vs. Stanley Services, Inc., et al.
District Court of Liberty County, Texas, 253rd Judicial District
Cause No. CV1003827
Deposition Testimony, Baytown, Texas
September 25, 2013
Client: Mr. Dan Linebaugh

120704 Cynthia Seamon vs. Remington Arms
United States District Court, Middle District of Alabama, Northern Division
Case No. 2:12-cv-895
Deposition Testimony, Dallas, TX
October 23, 2013
Client: Mr. Tim Monsees

120707 King Bradley Jr. and Christie Bradley v. Ameristep, Inc., and Primal Vantage Co.
Unites States District Court, Western District of Tennessee, Jackson Division
Case No. 1:12-CV-0116
Deposition Testimony, Kansas City, MO
November 12, 2013

Client: Mr. Tim Monsees

121002 Wayne Trask, Beth Trask, and A.T. vs. Olin Corporation
United States District Court, Western District of Pennsylvania, Pittsburgh Division
Case No. 2:12-cv-00340-NBF
Deposition Testimony, Pittsburgh, PA
October 31, 2013
Clients: Mr. Jason Schiffman and Mr. Michael Trunk

130101 Estate of Lincoln Ogle v Chrysler Group, Dorel Juvenile Group, et al.
District Court of Cleveland County, State of Oklahoma
Case No CJ 2011-1766-L
Deposition Testimony, Oklahoma City, Oklahoma
February 14, 2013 and June 21, 2013
Trial Testimony, Oklahoma City, Oklahoma
July 23-24, 2013
Client: Mr. John Norman

130103 Bonita L. Brown v. Harbor Freight Tools USA, Inc.
United States District Court, Western District of Missouri, Southern Division
Case No. 13-3130-CV-S-REL
Deposition Testimony, Oklahoma City, OK
September 16, 2014
Client: Mr. Kevin Krueger

130104 Estate of Edward Davis v. Alstead Gun Shop
Cheshire County District Court, New Hampshire
Case No. 213-2013-CV-00050
Deposition Testimony, Oklahoma City, Oklahoma
June 24, 2014
Client: Ms. Kristin Ross